On Donax and Other Sandy-Beach Inhabitants

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WHILE ENGAGED IN a study of diseases of the bean clam Donax gouldii, I had the opportunity to make various ecological observations on this little clam and its co-inhabitants of the sandy surf-washed beaches of southern California and northern Baja California. This brief report will enumerate some of these observations which, to my knowledge, have not been recorded previously.

Donax variabilis texasiana PHILIPPI, 1847 and D. fossor SAY, 1822 from the new world and D. semigranosus DUN-KER, 1877, of Japan have been observed to migrate up and down the beach according to the tidal level (TURNER & Belding, 1947; Mori, 1938, 1950; Jacobson, 1955; LOESCH, 1957). The clams "pop out" of the sand on the uprush of an incoming tide or backwash of the outgoing tide, travelling several feet or yards, then halting progress with the extended foot, they rapidly dig under the sand once again. Donax gouldii DALL, 1919, exhibits the same tendency but to a lesser degree than in species which may inhabit steeply sloping beaches in areas of great tidal differences. In the range of D. gouldii mean high and mean low water vary only one to three feet except at spring tides so the uncovered sand of the intertidal zone usually stays fairly wet. As well, the only stable bean clam populations I found were on gently sloping beaches where marked migrations with incoming or receding waves are not so possible. During neap tides at Estero Beach, Todos los Santos Bay, Baja California, I observed a scattering of gaping or dead, semi-desiccated bean clams along the high tide line where they must have been cast by the incoming tide as they migrated up the beach. One would assume D. gouldii is not particularly resistant to drying and in such an instance extreme tidal migrations can lead to disaster for the clams.

Almost all the dead and gaping clams mentioned in the preceding paragraph were hosts to one or more dipterous larvae. Some of the larvae were reared to adult stage and identified as the sarcophagid *Blaesoxipha californica* (PARKER, 1918) by C. W. Sabrosky, Insect Identification Branch, U. S. Department of Agriculture. The stranded clams were not numerous and had been above the water line no more than four hours, testifying to the great skill of female flies in detecting the presence of animal remains.

Little is known of the life history of the colonial hydroid, Clytia bakeri TORREY, 1904, which occurs commensally on the shell of Donax. At La Jolla Beach, Todos los Santos Bay in October, 1964, only a very few members of a dense, young bean-clam population, had strands of Clytia on their shells. Their condition was similar in January, 1965. However, by August, 1965 almost every clam had a plume of Clytia and the hydroid itself supported a brown alga which covered the entire plume. At Estero Beach, about five miles north of La Jolla Beach and separated from it by the entrance to the Estero, an older Donax population was well provided with Clytia and its attendant alga during the entire period of observation. In another young population of Donax some miles north of Estero Beach even clams as small as 7 or 8 mm in length were heavily covered with Clytia.

The ideal habitat for *Donax gouldii* appears to be a very gently sloping beach with a certain amount of shallow sand-barring just beyond median low tide level. A beach of this type has firm, fine-grained sand which probably results in less abrasive action on the clams. The conditions occurring in the low tide zone of such open beaches are only marginally satisfactory for animals said to normally occupy sand flats (RICKETTS & CALVIN, 1962). Nonetheless, these beaches do support fair numbers of sand-flat animals. The sand collars (egg cases) of the moon snail, *Polinices reclusiana* (DESHAYES, 1839) are commonly seen at Belmont Beach, Newport Beach, Scripps Beach (at La Jolla, California), and farther south on the beaches of Todos los Santos Bay. Near Newport pier during summer, 1964, *Dendraster excentricus* (ESCHSCHOLTZ, 1831) and

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Olivella biplicata (SOWERBY, 1825) were common, and several individuals of *Renilla koellikeri* PFEFFER, 1886, were found. At Belmont Beach and Scripps Beach I have observed sizable colonies of *O. biplicata* as well as extensive colonies in the shallow low-tide zone at Estero Beach. At both Scripps Beach and Estero Beach the number of drilled shells of *Donax* occurring together with living moon snails indicates *Donax* must serve as an important food source for this predaceous drill. Another snail, *Nassarius fossatus* (GOULD, 1849), was found once at Scripps Beach and several times at Estero Beach.

Olivella biplicata not only occupies the same intertidal zone as Donax gouldii, but at Belmont and Scripps beaches individuals were twice observed to regularly "pop out" of the sand where backwash created currents about one's feet. These snails travelled several feet seaward before extending the foot, anchoring themselves, and disappearing once again under the sand. In this habitat they closely approximated the actions of Donax in a similar situation and one may wonder if olive shells also perform tidal migrations.

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